# TECHNICAL MEMORANDUM

Utah Coal Regulatory Program

August 5, 2008

TO: Internal File

THRU: Daron Haddock, Permit Supervisor

FROM: Priscilla Burton and Coal Hollow Review Team PWB by SRS

SUBJECT: Alluvial Valley Floor Review – Coal Hollow Mine, Alton Coal Development, LLC, Kane County, C/025/005, Task ID #2910,

**SUMMARY:**

The Coal Hollow Review team members (Jim Smith, Dave Darby, Joe Helfrich, Wayne Western and Priscilla Burton) have had several technical discussions on the potential for an Alluvial Valley Floor within the Coal Hollow permit area. What follows is a compilation of the views expressed by all team members during these discussions. The review team members were given an opportunity to review, comment and edit this assessment, prior to it's inclusion in the Technical Analysis dated 8/26/2008.

## ALLUVIAL VALLEY FLOORS

Regulatory Reference: 30 CFR 785.19; 30 CFR 822; R645-302-320.

**Analysis:**

**Alluvial Valley Floor Determination**

The applicant has made a request for determination of alluvial valley floor for the proposed Coal Hollow Mine and Sink Valley Wash area.

### Background Information

The Alton/Sink Valley area was the subject of a much larger, mine permit application in 1982 and 1987 by Utah International Inc. (UII, P/025/003). The UII application included the Sink Valley area in T 39 S, R. 5 W. and surrounding federal leases in T. 39 S., R. 6 W.; T. 40 S., R. 4 W.; T. 40 S., R. 4 ½ W; T. 40 S., R. 5 W; and T. 40 S., R. 6 W. The federal leasing required an Environmental Impact Statement (Development of

Coal Resources in Southern Utah, 1979). The Office of Surface Mining (OSM) commissioned a reconnaissance report of the alluvial valley characteristics of the Alton Area in 1980. The resulting report, by Jack Schmidt was titled, "Reconnaissance Determination of Alluvial Valley Floor Status and Assessment of Selected Geomorphic Parameters in selected Stream Valleys of the Alton Petition Area and Adjoining Lands, Garfield and Kane Counties, Utah." The Schmidt report details agricultural production, water rights and water diversions in the Alton amphitheater and Johnson Canyon at the time. The report describes a very active agricultural community in Sink Valley and adjacent areas. (Jack Schmidt's full 1980 report can be found at 025/0005/2006/Incoming/0012.pdf.)

In 1983, OSM mapped the Sink Valley alluvial valley floor (AVF) and stressed the importance of agricultural land use in making the Sink Valley AVF determination, in the absence of more typical geology associated with an alluvial valley (OSM 1983 [draft] Alluvial Valley Floor Identification and Study Guidelines, Appendix D, pg. D-2 and D-6). OSM stated that the initial reconnaissance conducted of the Alton area by Jack Schmidt in 1980 was sufficient to confirm the existence of an alluvial valley floor based upon the importance of the valley land to agriculture (pg. D-4), but suggested that an Applicant for a mine permit might collect additional data to clarify the regional hydrologic pattern (page D-2).

OSM was required to make specific detailed findings with regard to the protection of the hydrologic balance and reclamation during the processing of the Alton mine permit application (which included tracts of federal leases) in response to petition and litigation in United States District Court for the District of Utah, Central Division (0250003/1987/Incoming/0040.pdf). The Court's Memorandum of Decision and Order was dated February 12, 1985.

The February 8, 1988 Initial Completeness Review for the 1987 UII Alton Mine application indicates on page 34 that the following areas were identified as probable alluvial valley floors (filed as 0025/0003/1988/Incoming/0023.pdf):

1. Upper Skutumpah Creek, Sec. 20 and 29, T40 S., R 4 1/2 W.
2. Skutumpah Creek, Sec. 30, T. 40 S., R. 4 ½ W.
3. Thompson Creek and Tributaries, Sec. 30 and 19, T. 40 S, R 4 ½ W and Sec. 24, 13, 12, T 40 S., R. 5 W.
4. Bald Knoll Hollow, Sec. 14, 15 and 16, T. 40 S. R. 5 W.

The Division further stated in the Initial Completeness Review on pages 35 that the following areas had been "positively" determined to be Alluvial Valley Floors:
1. Skutumpah Creek in Sec. 32, T.40.S., R.4 ½ W. and Sec. 5 and 6 in T.41 S., R. 4 ½ W.
2. Thompson Creek in Sec. 31, T.40 S., R.41/2 W. and Section 6 in T.41 S., R.4 1/2 W.
3. Upper Sink Valley Wash in Sec. 32, T. 39 S., R. 5 W. and Sections 5 and 8 in T. 40 S. R. 5 W.
4. Sink Valley in Sections 19, 20, 29, and 30, T. 39 S., R. 5 W.

5. Lower Swapp Hollow in Sec. 28, T. 39 S., R. 5 W.
6. Kanab Creek in Section 18, 24, 25, 26, and 36, T. 39 S., R. 5 W.
7. Alton Amphitheater in Sec. 6 and 7, T.39S., R.5W. and Sec. 1, 11, 12, and 13 in T.39S. R.6W.

The Coal Hollow proposed permit area encompasses the Sink Valley in Section 19, 20, 29 and 30 in T. 39 S., R. 5 W. The Division's 1988 decision was based upon borehole data showing sorted deposits of sand size or larger particles and previously published information, as laid out in a memo from Richard Smith, Geologist, to John Whitehead, Permit Supervisor, dated November 9, 1987 (025/0003/1987/Internal/0002.pdf).

The UII commissioned Water Engineering Technology, Inc. (WET) of Fort Collins, CO to evaluate the Sink Valley area. The1988 WET report, titled "Geomorphological and Sedimentological Characteristics of Sink Valley, Kane County, Utah" argued that the sediment in Sink Valley is comprised of coarse material in an alluvial fan laid down by unconfined sheet floods, debris flows and mud flows. The report claims there was never a continuous stream in Sink Valley. Thus, by R645-100 definition, a lack of a continuous stream channel meant an alluvial valley floor in Sink Valley could not exist.

The Division was not persuaded by the WET report. To the contrary, Richard Smith, Division Geologist, viewed the WET report as further evidence of unconsolidated stream-laid deposits holding streams and reported as much to the Division Associate Director, Ken May, on October 13, 1988. His memo cited near surface deposits of sand sized particles, selectively sorted, and deposited within and adjacent to stream channels, as well as the presence of smooth land surfaces and channels exceeding 3.0 ft. wide X 0.5 ft. deep within Sink Valley, and the established agricultural land use, for a positive determination of an alluvial valley floor in Sink Valley (0250003/1988/Internal/0001.pdf).

## Current Coal Hollow Mine Application

This 2008 Coal Hollow Mine application includes the WET 1988 investigation in Appendix 7-4; current reconnaissance by Peterson Hydrologic Inc. in Appendices 7-1; and. Alluvial Valley Floor Supplemental Information in Appendix 7-7 that specifically addressed land use, soils, vegetation and hydrologic questions raised by the Division during the 2007 Administrative Completeness review.

In the discussion below, the Division evaluates the application for information pertinent to R645-302-321, in order to make a determination of the extent of any alluvial valley floor within the proposed permit area, and adjacent area, per R645-302-321.300. The applicable R645 Rules are used to organize the discussion.

**R645-302-321.210 Mapping of Unconsolidated Streamlaid Deposits Holding Streams**

Appendices 7-1 and 7-4 refer to the definition of "alluvial valley floor" in the R645-100 Rules which exclude from an alluvial valley floor all "upland areas...composed chiefly of debris from sheet erosion, deposits formed by unconcentrated runoff ...or other mass movement accumulations..." The term, "upland areas" is also defined in R645-100 and means, "those geomorphic features located outside the floodplain and terrace complex, such as isolated higher terraces, alluvial fans...."

The applicant states that no flood plains or stream laid deposits were identified in the project area, consequently a map of the flood plain and terraces was not created for Robinson Creek and Sink Valley Wash (App. 7-7, pp. 4-5). The Applicant found no evidence of flood plain and terrace features that are characteristic of alluvial valley floors (App. 7-7, pp. 4-5) and suggests that coalesced alluvial fans form the surface of Sink Hollow Wash (App. 7-7, pp. 2-3). The cross section across the fan is convex, not planar. The Division notes that Appendix D of the 1983 OSM AVF Guidelines acknowledges the topography does not fit the typical flood plain and terrace system, but that the topography is suitable for irrigation.

Aerial photos such as Plate 1 in App. 7-7 indicate numerous discontinuous channels, but no continuous channel in Sink Valley Wash. The Applicant suggests the lack of continuous channel is indicative of an alluvial fan, but not of stream laid deposits. The applicant states that the lack of a continuous channel may be partly due to human activity (construction of diversions, ponds), and may also be due to deposition by mud flows, sheet floods, and debris flow. The Division notes the discontinuous channels shown on Plate 1 seem to coincide with the historically developed pastureland shown on Dwg 3-1.
[The permit boundary should be shown on Plate 1 for ease of comparison with other (larger scale) plates.]

Neither the federal or R645 Rules use the term "continuous channel" to define alluvial valley floor. Although the Applicant's field investigation indicates the main Sink Valley Wash channel is not continuous, Figure 19 shows a stream channel in Sink Valley. In addition, the water rights map, Drawing 7-3, indicates continuous point-to–point diversions along the length of the Sink Valley Wash channel and the USGS Alton Topographic Quad shows a continuous channel for Sink Valley Wash. Alluvial ground water is present in confined piezometers at a depths of two to twenty feet within the proposed permit area (Table 1, App. 7-7 ). Unconfined water is evidenced by the numerous springs shown on Dwg. 7-1.

The direction of shallow groundwater flow is shown in Figure 21 of App. 7-1. Dwg. 7-13 shows local saturation levels in the alluvium of Sink Valley, but does not represent a potentiometric surface. The Applicant concluded that the distance between the monitoring wells and the perched, discontinuous nature of the saturated zones did not

allow extrapolation of the potentiometric data for the entire permit area (App. 7-7, Sec. 2.6). The Applicant also concluded that an isopach map of the depth to saturation, based on the soils pits and shallow exploration bore holes, was not possible, because a continuous saturated ground-water system was not found (App. 7-7, pp. 7- 8). The Division notes that Table 2, App. 7-7 indicates depth to ground water in soil pits was between one and six feet on the eastern side of the permit area and between four and ten feet in the center of the permit area.

Figure 8, App. 7-1 illustrates the geology in cross-section. Figure 8, App. 7-7 shows the streams, pond,s springs, and well locations in relation to surface geology, as well as the projected location of the pits and permit boundary. The Applicant states that Kanab Creek and its tributaries are downcutting. Robinson Creek, the only continuous channel in the Sink Valley Wash area, is deeply incised and appears to be actively downcutting. The Division notes that Appendix D of the 1983 OSM AVF Guidelines acknowledges the entrenched stream courses (pg D-4) and states that the central question becomes, what valleys have the capability to be irrigated?" ( pg D-8). The OSM AVF assessment assumes water can be "transported to any terrace level, providing that a part of that level had historically been irrigated." (pg. D-8). The more important issue is water availability (pg D-9).

Adjacent areas along Kanab Creek and lower Sink valley are not mapped, but are required to be mapped and evaluated by R645-302-321.100, and also are required to be mapped, because they may currently be or may have historically been irrigated.

**R645-302-321.220 Mapping of Agricultural Lands**

App 7-7, Sec. 4.1 through 4.3 provides a description of the agricultural use of lands within and adjacent to the permit area by cattle and for crop production. The locations of existing undeveloped rangeland, subirrigated lands, crop lands and pastures are shown on Drawing 3-1 and Drawing 7-7. There are 69 acres of meadow, 192 acres of pasture, 215 acres of sagebrush/grass land and 40 acres of oak brush, and 114 acres of pinyon /juniper in the permit area (un-numbered Table, Sec. 321.100, Chap. 3, pg. 3-3). Dry meadow acreage is described in Section 311.100, but the acreage was not calculated. The Division estimates the dry meadow acreage to be twenty acres. Meadow, pasture and oak brush are by far the most productive lands with production estimated (not measured) at between 1,100 to 2,000 lbs/acre (Table 3-34 ,Sec. 321.100, Chap. 3).

Grazing lands supported by numerous seeps and springs dominate the proposed permit area as shown in Chap 4, Ex. 4.1. Crop land is illustrated on Ex. 4.1 east of the proposed permit area. Acreage under production was not provided, and Ex. 4.1 has no scale, so that acreage can not be calculated. Drawing 7-1 shows the total number of seeps and springs in the permit area available for grazing animals. Drawing 7-7 shows the ponds and ditches developed to support agriculture. Both Pugh and Dame own lands designated pastureland or subirrigated meadow lands within the permit area that have been leased to Alton Coal Development (Dwg. 3-1 and 7-7). How long the lands have been out of production was not stated.

The Pugh lands were formerly quite productive: 700 bushels/acre of potatoes were raised with irrigation on the Pugh property in 1917 and in the 1950's oats and wheat crops were produced (personal communication with C. Burton Pugh, September 6, 2006).

Acreage of crop production shown on Ex. 4.1 in the adjacent area should be provided as well as mapped, along with acreage figures and mapping of the adjacent areas under production along Kanab Creek and lower Sink valley.

**R645-302-321.230 Mapping of Current or Historic Flood Irrigated Lands**

7-7 identifies flood irrigated and subirrigated lands, ditches that have been used for irrigation, and ponds that were probably part of irrigation systems. Based on conversations with a local resident, the Applicant concludes in Section 728.334, that there has been no irrigation during the past 10 years. The reason given for the decline in agricultural activity is the lack of appreciable quantities of water (App 7-7, pg. 13). Water monitoring conducted between 2005 and 2007 shows no appreciable difference from the 1987-88 data.

Appendix 7-7 describes the general construction and use of the water holding ponds. There are few conveyance systems between ponds; all conveyance systems in the area are indicated on Drawing 7-7. The conveyance systems consist of earthen ditches.

Stockwatering is the use stated on most of the water right printouts in Appendix 7-3, but most spring and surface-diversion rights in the W/2 of Sec. 29, E/2 of Sec 30, and W/2 of Sec. 32, T. 39 S., R. 5 W., along Sink Valley Wash around and downstream of the Swapp Ranch, either cover both stockwatering and irrigation or are for irrigation only. Ponds are used for stockwatering and irrigation systems (App. 7-7, pg. 14).

Meadowlands shown on Dwg 3-1 are dominated by sedges, rushes and wild iris are subirrigated and the depth to alluvial groundwater is within "inches to a few feet below the ground surface" (App. 7-7, pg. 10). Depths to ground water in the pasturelands varies seasonally from within one or two feet to several feet below the surface (App. 7-7, pg. 12 and Table 1).

The Pugh lands were formerly irrigated using ditches, ponds, and pipes to bring water from as far as upper Robinson Creek (discussion with C. Burton Pugh in September 2005). Today, pasture lands in the permit area, dominated by introduced grass species, rely on precipitation and stored soil moisture for growth (average approximately 16 in/yr) and not on irrigation or subirrigation (App. 7-7, pg. 12). The Division notes that Dame's pasturelands may be subirrigated by the active water rights on Pond 29-3 and 29-5 (Dwg. 7-7).

Darlynn Sorensen currently uses flood irrigation for hay or grain production on his property at the south end of Sink Hollow Wash (Dwg. 7-7). Irrigation typically was a

single flood application in the spring, when adequate water was available (App. 7-7, pg. 13). Acreage of the Sorenson flood irrigated lands was not provided.

The Applicant has shown that the agricultural use of the land within the permit area has declined and that Pugh's subirrigated meadows on the eastern side of the permit area are now supporting undeveloped grazing. Acreage of irrigated lands is not provided. Adjacent flood irrigated or subirrigated areas along Kanab Creek and lower Sink valley were not mapped.
Adjacent area lands are required to be mapped to show historic and current flood irrigated lands.

**R645-302-321.240 Documentation of SubIrrigation**

The locations of subirrigated lands are shown in Drawing 7-7 and described in App. 7-7, Sec 4.1. Drawing 3-1 shows meadow communities that are sub-irrigated. App. 7-7, Sec. 5.4.2 describes the meadow communities. These communities are all on the east side of the proposed permit area and they are all fed by springs. There are 260 acres of meadowland and pastureland within the proposed 653 acre permit area ( table on pg.3.3, Chap. 3 and Dwg. 3-1).

Soils in Map Unit 7 are wet. These soils are mapped on Dwg. 2-1 and their location correlates with the subirrigated lands shown on Dwg. 7-7. Map Units 6 and 13 have localized areas of subirrigation, including the approximately 20 acres of dry meadows shown in Plate 3-1 on the west side of County Road 136. The Applicant states that the representation of subirrigated lands on Dwg. 7-7 does not include these dry meadows that may also be subirrigated (pp. 10 and 12, App. 7-7). Depth to ground water within these meadows and pastures is provided in App. 7-7, Section 3.4, p. 10. The Applicant points out in App. 7-7, Sec. 2.6 that potentiometric data from piezometers (Table 1) does not represent shallow ground water conditions which are logged in Table 2 for the many soil pit locations shown on Figure 5 of App. 7-7. Together, Table 2 and figure 5 report that depth to water is between 50 and 120 inches in Sections 19 and 20 (T39 S, R5 W) and between 14 and 30 inches below the surface in Section 29 at the mouth of Swapp Hollow and between 60 and 80 inches in the E ½ S 1/4 of Section 30 on the southern most portion of the permit area. Depth to groundwater becomes very shallow again as one approaches Johnson Spring (shown on Dwg 7-2).

Soil mottling confirms subirrigation in plant communities (App. 7-7, Figure 10). The meadow and dry meadow plant communities grow where soils are sub-irrigated. App. 7-7 Section 5.4.4 refers to table 7 that identifies the characteristics of the meadow and dry meadow plant communities. App. 7-7 Section 6.4 states that "the topographic characteristics of most lands within the project area are compatible with flood irrigation techniques," and pasture land in the proposed permit area has the potential for subirrigation. In fact, Figure 10, App. 7-7 indicates that fine roots in all plant communities extend between 50 and 80 inches below the surface (with the exception of the very shallow pinyon/juniper community). The deepest rooted community is the Oak

Brush at 80 inches. The shallowest rooted is the meadow community at 50 inches. The shallow rooting depth likely correlates to the availability of water.

The information provided indicates a substantial area of subirrigated meadow and potentially irrigated pastureland within the proposed permit area. Adjacent areas along Kanab Creek and lower Sink valley are required to be mapped.

**R645-301-321-250 Documentation Of Water Quality and Yield, Stream Flow, Soil Characteristics, and Topography Affecting Flood Irrigation Potential**

App. 7-7 Figure 8 shows all of the springs emanate from the alluvium (Qa). Seven springs are outside the permit area and three (SP 14, SP22, SP23) are inside the permit area. SP22 and SP 23 are on the edge of the mine pit boundary. . Table 3 and Figure 9 provide the water quality of two selected springs, SP6 and SP8 that represent the south and north subirrigated lands shown on Dwg 7-7. App 7-7 Section 5.2 compares water quality with the OSM guidelines for irrigation water suitability (Figure B-5 in OSM, 1983 Alluvial Valley Floor Identification and Study Guidelines). The spring water that is subirrigating lands in the permit area is Class 2 (medium salinity hazard, but not sodic) in the northern permit area, but degrades to Class 3 (high salinity hazard, not sodic) in the southern permit area. Adequate drainage and salt tolerant plants, such as alfalfa and some grasses would be recommended. The Division notes that water quality in the southern permit area has improved considerably between 1987-88 sampling and 2005 sampling, perhaps due to less grazing pressure or less agricultural activity?

Table 9 in App. 7-7 provides discharge and water quality data for selected surface water monitoring locations that are shown on Dwg. 7-2: Section 21 Canyon drainage (SW 7); Upper reach of Swapp Hollow (SW 8); Left Fork of Sink Valley (SW 6); (left) Dry Fork of Robinson Creek (SW 4); Lower Robinson Creek near the confluence with Kanab Creek (SW 5); Robinson Creek at the location where it is to be re-routed within the proposed permit area (SW 101); Water Canyon (RID-1) aka the right fork of Robinson Creek and source of diversion water. Drawing 7-7 of irrigation structures should be drawn on the same scale as Dwg. 7-2, so that the point of diversion on Robinson Creek could be known in relation to the monitoring point SW 4; and so that the monitoring point for Water Canyon (RID-1) can be seen in relation to the Water Canyon diversion to the Pugh pasture. These relationships must be shown to confirm that monitoring accurately portrays the water supply. The Division notes that Sink Valley is monitored at SW 6, in a location that does not receive flow from the eastern canyons.

Swapp Hollow water is medium salinity, with low sodium hazard, suitable for most plants. Swapp Hollow Creek has the best potential to support flood irrigation. The Applicant states that the average instantaneous discharge measured is 55 gpm. Calculated annual yield is 88.7 acre-feet, which would irrigate approximately 24 acres of alfalfa or 33 acres of pastureland using an earthern ditch distribution system (App. 7-7, Sec. 6.1.1 and Table 9).

Lower Robinson Creek, Dry Canyon, Section 21 drainage, Upper Water Canyon spring diversion, Sink Valley Wash, and alluvial ground water discharges have less potential to support flood irrigation. The Applicant states the flow volumes are low and inconsistent. Water Canyon spring has good quality water. Water quality of the other potential sources is not discussed, mainly because analyses are sparse due to no-flow conditions.

Pond 29-3 on Richard Dame's property is fed by groundwater from an alluvial spring. Surface water collects downstream in pond 29-5, also on the Dame property (pg. 14, Sec. 4.2, App. 7-7).

The Sorenson's flood irrigated croplands are outlined on Dwg 7-7. The Sorenson property is just east of the permit area (Dwg 1-3). App. 7-7 Sec. 4.1 relates that ponds 29-1 and 29-2, as well as the ponds 29-6, 29-4, 29-7, 29-8, 29-9 [that function as a series of overflow ponds down the Sink Valley drainage] and pond 32-1 are all on Sorenson property. Of the Sorenson's ponds, only pond 29-7 is equipped with an outlet control structure for irrigation.

A portion of the Pugh property is subirrigated, the rest was flood irrigated with a diversion Water Canyon (Dwg 7-7). Pond 20-1 is located on the Pugh property and it is equipped with an outlet control structure for irrigation (Sec. 4-2, App. 7-7).

Water quality data indicate that there may be enough water to flood irrigate; that the quality of water is sufficient to raise alfalfa or other grasses for hay crops and pasture. The volume of water to be encountered during mining and the handling of that water, as well as the effect of encountering alluvial water on the agricultural production is requested.

**R645-302-321-260 Analysis of Aerial Photography Showing Seasonal Difference between Valley and Upland Vegetation.**

Appendices 7-7 provides two aerial photographs of the valley floor. Plate 3 provides infrared imagery that was flown in July 15, 2006. Plate 4 provides imagery that was flown November 2, 2007. The applicant has labeled areas of wet meadow and wet pasture, and this vegetation type was described in the application. No acreages were provided. Although the imagery was referenced in the Application, there was no analysis provided of the two plates to show late summer and fall differences between upland and valley floor vegetative growth.

Information on the ground water found in the geotechnical boreholes (Appendix 5-1) has been included in the discussion of ground water and seasonal variation in App. 7-7 (p. 7). Seasonal variation of the piezometers is portrayed in hydrographs in Figure 3 and on Table 1 of App. 7-7. Variation of the depth to ground water and aquic

conditions in the alluvial sediments, as observed in the soils pits, is provided in Table 2 and Figure 5 of App. 7-7, but seasonal variation is not discussed. Figure 6a and associated cross-sections provide a schematic representation of the thickness of the alluvium, stratigraphy, and depth to ground water at monitoring locations. Seasonal variation in alluvial water levels and vegetation changes was not noted (App. 7-7, p. 8), but was reported to be just below the surface at the beginning of the growing season, falling to a couple feet below the surface at the end of the growing season (App. 7-7, pg. 10). Seasonal variability of springs outside of the permit area was referenced on p. 11, App. 7-7. The applicant noted no specific correlation between seasonal variations of water levels and vegetation changes.

## Adjacent Area

The Division is required to protect adjacent areas designated as alluvial valley floors, as per R645-302-320 and R645-302-322. Adjacent area is a defined term and means the area outside of the permit area where a resource or resources are or reasonably could be expected to be adversely impacted by the proposed coal mining and reclamation. As applied to an AVF determination, the adjacent area should include areas where there are characteristics used to evaluate the AVF and particularly areas where the hydrology regime may be affected by the mining and consequently may affect an AVF.

Adjacent alluvial valley floor areas are shown on Figure 3 of Appendix D of the 1983 OSM Alluvial Valley Floor Determination Guideline. The Applicant addresses the characteristics of Robinson Creek and Kanab Creeks in relationship to alluvial valley floors, but does not specifically classify them as alluvial valley floors. Adjacent agricultural areas along Kanab Creek and lower Sink valley should be documented in accordance with R645-302-322.100 and R645-302-322.200.

Adjacent alluvial valley floors should be mapped and agricultural production in these areas should be described (acreage under production in pasture or crop land, value of crop/acre, location of irrigation diversions and pond structures, water quantity and quality, etc.) so that the Division can assess the significance of these adjacent areas and the potential affects of surface mining on these adjacent agricultural operations.

**Findings:**

In accordance with R645-302-321.300, the Division must make a finding of the extent of any alluvial valley floors within the study area (permit and adjacent area).

The Division notes that Appendix D of the 1983 OSM AVF Guidelines acknowledges the topography does not fit the typical flood plain and terrace system, but that the topography is suitable for irrigation. The Division notes that neither the federal or R645 Rules use the term "continuous channel" to define alluvial valley floor and that the discontinuous channels shown on Plate 1 seem to coincide with the historically

developed pastureland shown on Dwg 3-1. Although the Applicant's field investigation indicates the main Sink Valley Wash channel is not continuous, Figure 19 shows a stream channel in Sink Valley. In addition, the water rights map, Drawing 7-3, indicates continuous point-to–point diversions along the length of the Sink Valley Wash channel and the USGS Alton Topographic Quad shows a continuous channel for Sink Valley Wash. Alluvial ground water is present in confined peizometers at a depths of two to twenty feet within the proposed permit area (Table 1, App. 7-7 ). Unconfined water is evidenced by the numerous springs shown on Dwg. 7-1.

The Applicant states that Kanab Creek and its tributaries are downcutting. Robinson Creek, the only continuous channel in the Sink Valley Wash area, is deeply incised and appears to be actively downcutting. The Division notes that Appendix D of the 1983 OSM AVF Guidelines acknowledges the entrenched stream courses (pg D-4) and states that the central question becomes, what valleys have the capability to be irrigated?" ( pg D-8). The OSM AVF assessment assumes water can be "transported to any terrace level, providing that a part of that level had historically been irrigated." (pg. D-8). The more important issue is water availability (pg D-9).

Grazing lands supported by numerous seeps and springs dominate the proposed permit area as shown in Chap 4, Ex. 4.1. Crop land is illustrated on Ex. 4.1 east of the proposed permit area. There are 260 acres of meadowland and pastureland within the proposed 653 acre permit area ( table on pg.3.3, Chap. 3 and Dwg. 3-1). Both Pugh and Dame own lands designated pastureland or subirrigated meadow lands within the permit area that have been leased to Alton Coal Development (Dwg. 3-1 and 7-7). How long the lands have been out of production was not stated. But Pugh lands were formerly quite productive.

Irrigation diversions and ponds used to support agriculture within the proposed permit area, and still provide for agriculture on the perimeter. Stockwatering is the use stated on most of the water right printouts in Appendix 7-3, but most spring and surface-diversion rights in the W/2 of Sec. 29, E/2 of Sec 30, and W/2 of Sec. 32, T. 39 S., R. 5 W., along Sink Valley Wash around and downstream of the Swapp Ranch, either cover both stockwatering and irrigation or are for irrigation only. Water quality data indicate that there may be enough water to flood irrigate; that the quality of water is sufficient to raise alfalfa or other grasses for hay crops and pasture.

In conclusion, the Applicant has not provided adequate information to refute the 1988 Division Alluvial Valley Floor determination made for Sink Valley in Sections 19, 20, 29 and 30 in T 39 S, R. 5 W. Although the Applicant has shown diminished agricultural use of the lands within the proposed permit area, water monitoring flow data from 2005 – 2007 does not demonstrate reduced flow from that collected during 1987-88 (Table 9, App. 7-7). Dry stream reaches are still dry. Swapp Hollow and Water Canyons are still the source of water for irrigation within the proposed permit area.

The Division requests the following information prior to making a final determination on alluvial valley floors, in accordance with:

**R645-302-321.100,** the Division continues to evaluate the existence of an AVF in the proposed permit area and has noted that Appendix 7-7 does not include a description of the AVF in the adjacent area. According to the analysis of historical information on file with the Division and the information in App. 7-7, an AVF is present to the south and west and possibly east of the proposed disturbed area. Appendix 7-7 should be revised to include information for these areas including at a minimum agricultural production and mapping of the extent of the AVF in Kanab Creek and lower Sink Valley. [DD, JH, PB, JS]

**R645-302-321.260,** Plates 3 and 4 include color infrared aerial imagery taken in July of 2006 and November of 2007. Although the application states that the imagery was used extensively by the researchers in various disciplines, the application needs to include an analysis of the two plates to show late summer and fall differences between upland and valley floor vegetative growth. [JH, PB]

**R301-302-321.230,** Maps showing the location of each diversion structure for all lands that are currently or were formerly historically flood irrigated on Kanab Creek and Sink Valley Creeks must include information on the alluvial valley floor west of the proposed permit area on Kanab Creek and south of the proposed permit area in lower Sink Valley. [DD, JH, PB, JS]

**R645-302-322.230,** The applicant shall address whether the operation will cause or present an unacceptable risk of causing material damage to the quantity or quality of surface or groundwater that supplies the adjacent alluvial valley floor of lower Sink Valley and Kanab Creek. Information to be provided should include the volume of water expected to be intercepted during mining and the volume of water currently used in agriculture along lower Sink Valley and Kanab Creek alluvial valley floors. [DD, JH, PB, JS]

**R645-302-323.110,** The applicant shall show that the proposed operation would not interrupt discontinue or preclude farming on an adjacent alluvial floor in lower Sink Valley and to the west on Kanab Creek. [DD, JH, PB, JS]